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Sensor Division

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Technical Information

(Catalytic Type Acetylene Gas Sensor)

Model NCP-180-A

(Matched Pair Type)

For Industrial Applications

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1. General

Catalytic type gas sensor NCP series were developed for industrial applications, and NCP-180-A is a matched pair type gas sensor for acetylene. Shape is similar to NCP-180, however the supply voltage and current is different from it. Features and typical applications are as follows.

2. Features and applications

1) Features

- Good stability
- Excellent repeatability and detection accuracy



- Good linearity against gas concentration
- Quick response
- Down-sizing for design flexibility of gas alarm or detector

2) Applications

- Fixed type gas alarm or detector for acetylene gas
- Acetylene gas densitometer

3. Ratings

- 1) Supply voltage to sensor
AC 2.0 +/- 0.1V(50–60Hz)
DC 2.0 +/- 0.1V
- 2) Current (when 2.0V is supplied)
AC 145 +/- 15mA(50–60Hz)
DC 145 +/- 15mA
- 3) Ambient temperature and humidity in operation
Temperature -20 - +60 degree C
Humidity Less than 95%RH
(without dew condensation)
- 4) Ambient temperature and humidity in storage
Temperature -30 - +70 degree C
Humidity Less than 99%RH
(without dew condensation)
- 5) Detection range
0 – 100%LEL

4. Specification

- 1) Zero offset value in air
0 +/- 25mV
(without trimming resistor)
 - 2) Minimum sensitivity
8mV/10%LEL of acetylene
 - 3) Response time
Less than 8 sec. at T90
Less than 3 sec. at T50
 - 4) Linearity
Effectively linear to 60%LEL
 - 5) Detection accuracy
+/- 1%LEL
 - 6) Span drift
Less than 1%LEL/month
 - 7) Zero offset drift
Less than 0.5%LEL/month
 - 8) Warranty period
24 months
- ## 5. Appearance and dimension

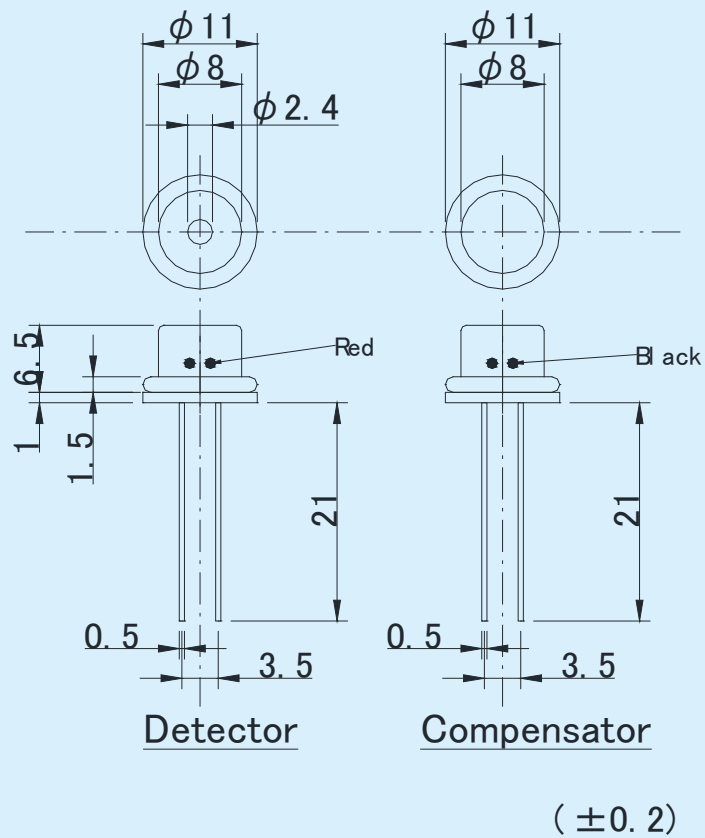


Fig. 1 : Appearance and dimensions

Remarks)

O-rings are attached on both as shown in the above.

6. Measuring circuit diagram

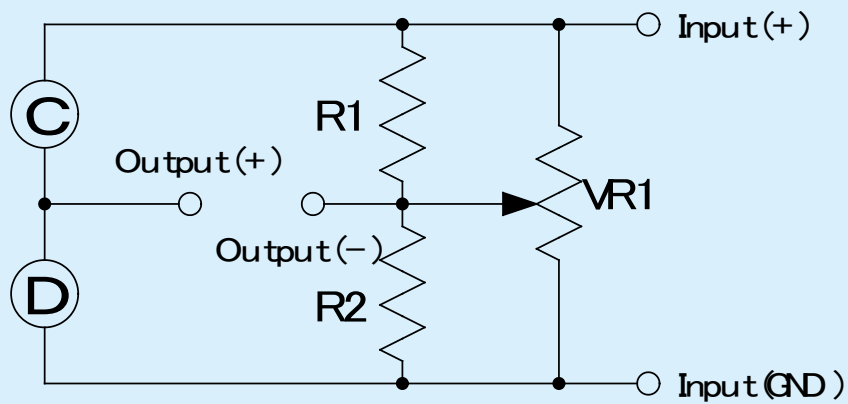


Fig. 2 : Recommended circuit diagram
(R1, 2 : 200ohm, VR1 : 3Kohm)



7. Gas sensitivity characteristics

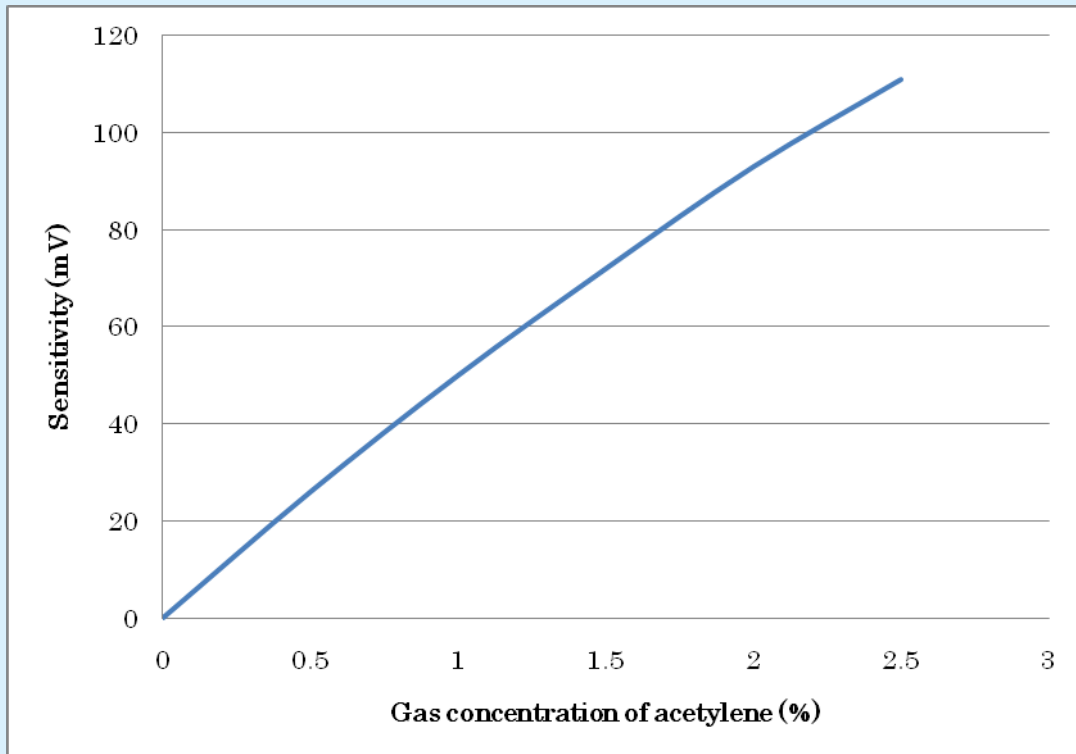


Fig. 3 : Gas sensitivity characteristics

8. Temperature dependence at 60%RH

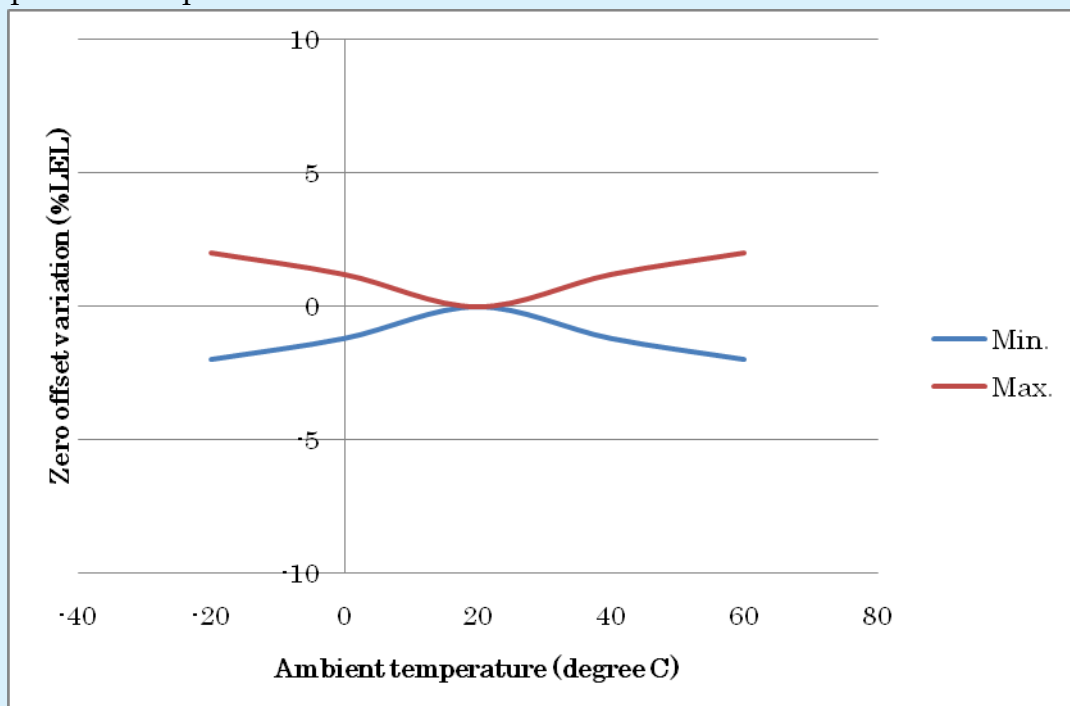


Fig. 4 : Temperature dependence of zero offset

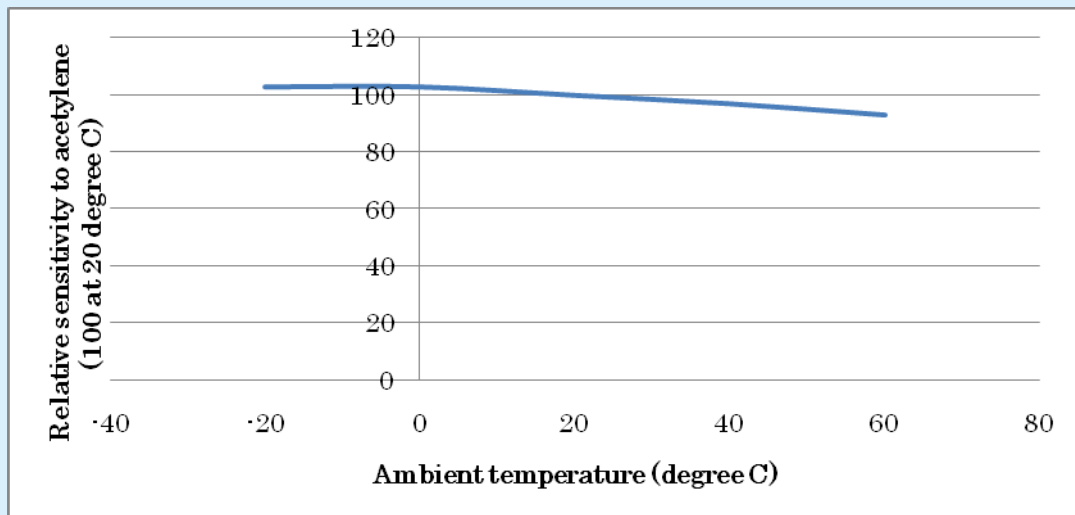


Fig. 5 : Temperature dependence of relative sensitivity to acetylene

9. Humidity dependence

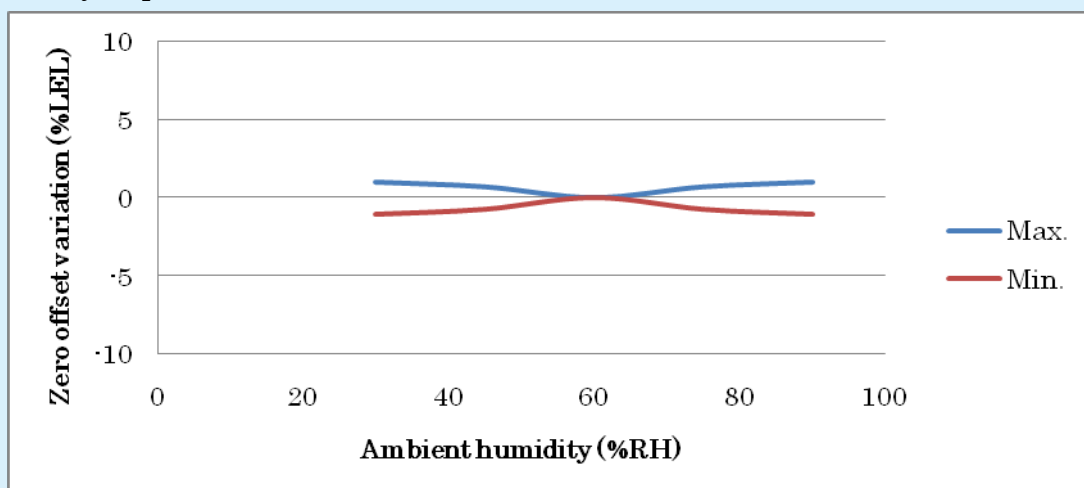


Fig. 6 : Humidity dependence of zero offset (at 25 degree C)

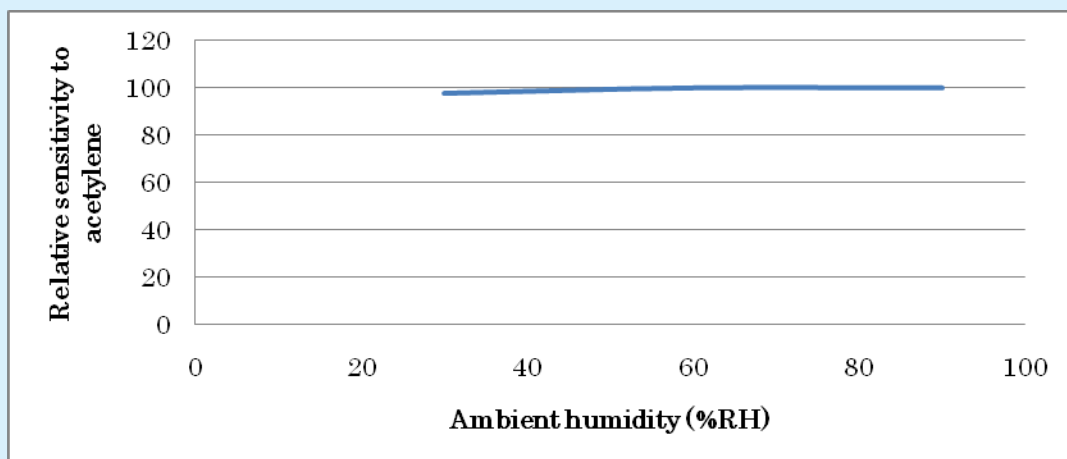


Fig.7 : Humidity dependence of relative sensitivity to acetylene



10. Sensitivity distribution

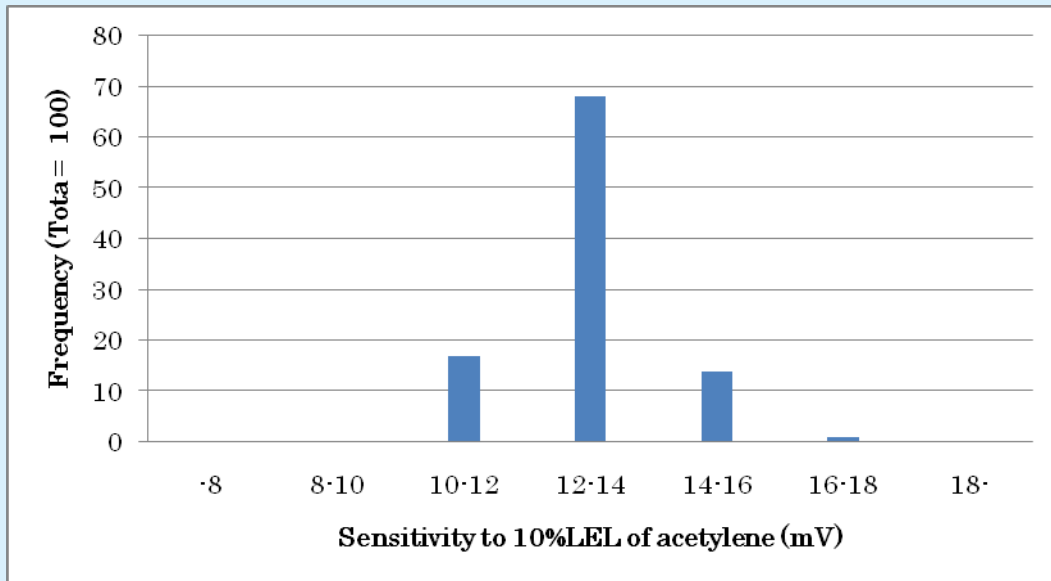


Fig. 8 : Sensitivity distribution

11. Relative sensitivity

(In case that sensitivity to acetylene is 100.)

Gas/Vapor	Chemical formula	LEL (%)	Relative sensitivity
Std. Acetylene	C₂H₂	2.5	100
1 Acetone	(CH ₃) ₂ CO	2.6	85
2 Ethanol	C ₂ H ₅ OH	3.3	90
3 Ethyl acetate	C ₂ H ₅ COOH	2.2	70
4 Ethylene	C ₂ H ₄	2.7	95
5 Methane	CH ₄	5.0	0
6 Iso-butane	C ₄ H ₁₀	1.8	35
7 Iso-propanol	CH ₃ -C ₂ H ₄ COOH	2.2	80
8 Methanol	CH ₃ OH	6.7	130
9 Methyl ethyl ketone	CH ₃ -CO-C ₂ H ₅	1.9	75
10 N-butane	C ₄ H ₁₀	1.8	35
11 N-heptane	C ₇ H ₁₆	1.05	60
12 N-hexane	C ₆ H ₁₄	1.2	65
13 N-pentane	C ₅ H ₁₂	1.4	55
14 Propane	C ₃ H ₈	2.1	25
15 Toluene	C ₆ H ₅ CH ₃	1.2	70
16 Ammonia	NH ₃	15.0	165
17 Carbon monoxide	CO	12.5	110
18 Hydrogen	H ₂	4.0	130
19 Unleaded petrol	-	1.2	65

Remarks)

If other data are required, please contact us since sensitivity of many combustible gases except bad smell, dangerous, poisonous and high boiling temperature materials over

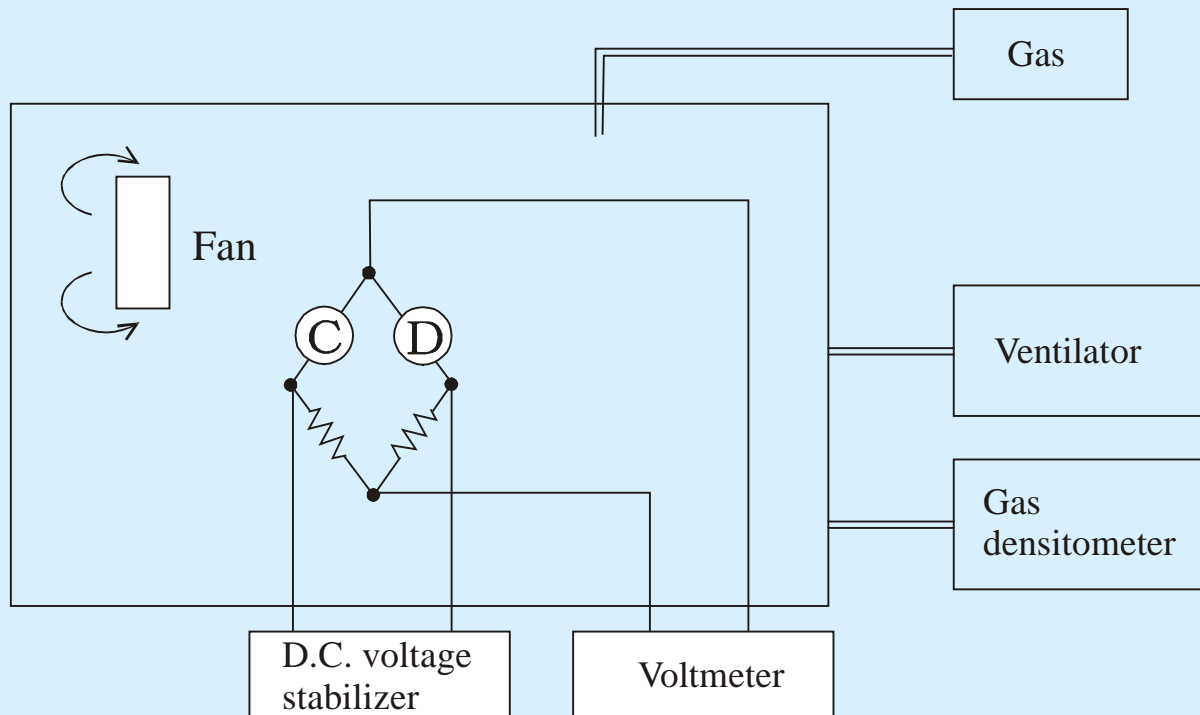


120 degree C are available for investigations.

12. Evaluation method

1. Test equipment

Outline of test equipment is as follows.



Remarks on equipments)

A) Test chamber

- Material of test chamber is to be inactive like metal, glass or acrylic resin which does not exhale and adsorb gases.
- Volume of test chamber is to be more than 1 liter per 1pc. of sensor.

B) Circumstance

- Clean circumstance is recommended as evaluation area. Dirty circumstance which contains combustible gases like organic solvent vapor is to be avoided.

C) Gas densitometer

- Laser gas densitometer is recommended, but volume method is available simply.

D) Agitation in test chamber

- Air agitation in test chamber is to be conducted carefully in order not to flow air to sensor directly. Air velocity to sensor is to be less than 0.5m/sec.

E) Power supply

- Both of AC power and DC power are available for sensor, however DC power supply is recommended for accurate evaluation.

F) Digital volt meter

- Since the impedance of sensor is fairly low, general digital volt meter having over 100kohm as input impedance is sufficiently available.

G) Ventilation



- Ventilator with ventilation capacity of over 10 times/min. of the volume of test chamber is recommended for the convenient evaluation.

H) Installation position of sensor in test chamber

- When the sensor is installed in test chamber, it should be careful that each sensor is to be in constant position because output signal changes in case that position of sensor changes. If the rough evaluation is carried out, such careful treatment is not necessary.

2. Adjustment of gas concentration

Adjustment of gas concentration is to be conducted by volume method or by using laser gas densitometer. In case of volume method, gas volume to be injected into a chamber is obtained from the calculation formula below described.

$$V(ml) = Vi \cdot C \cdot 10^{-6} \frac{273 + Tr}{273 + Tc}$$

V : Gas volume to be injected

Vi : Volume of test chamber (ml)

Tc : Temperature in test chamber ($^{\circ}C$)

Tr : Room temperature ($^{\circ}C$)

C : Target gas concentration (ppm)

3. Evaluation method

A. Preliminary aging

- Before evaluation of sensor, preliminary aging at rated voltage for over 1 hr. is recommended for accurate evaluation.

B. Measurement

- At first, output voltage in clean air is measured. It should be confirmed that output voltage has to be stable without fluctuation.
- Output voltage is measured around 1min. later after the designated volume of gas is injected into a test chamber.
- Inside of test chamber should be substituted of clean air by ventilator.

4. Notice on handling

- Sensor is to be gently handled without adding shock or dropping.
- Handling in a location which corrosive gases or poisonous gases exist is to be avoided.
- Sensor does not have to be dipped in water.
- Sensor does not have to be disassembled.
- Since sensor does not have an explosion proof structure, it should be assembled in an approved body.



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